Texas Fire Weather Operating Plan

for the

National Weather Service

FY 2001-2

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I Introduction

This document is the first annual Texas Fire Weather Operating Plan (TX-FWOP) serving to consolidate documentation of all fire weather services provided by NWS offices across the state.

This consolidation is part of the further Modernization and Associated Restructuring (MAR) of the NWS, under which fire weather services provided to Texas will become more standardized over the next several years.

The basic format of the TX-FWOP is such that information regarding fire weather services common to all state NWS offices is presented first. This is followed by information on products issued and special services offered by the NWS. Finally, information on fire weather services specific to each NWS office's County Warning and Forecast Area (CWFA) is presented. Customers of NWS fire weather products and services in Texas must understand that the current information provided in the "General Information" section of the Plan may not completely apply to them.

Due to the continuing changes in the NWS, this operating plan will be somewhat of a living document, and parts of it may need to be updated before the issuance of the 2002-3 plan. In the event this is necessary, affected agencies will be notified and addendums to the TX-FWOP will be issued. Important changes and clarifications of these fire weather services, including both general and specific information, will be listed in this introductory section in the annual update next year.

The chief editor of this first edition of the TX-FWOP is Monte Oaks (NWS Austin/San Antonio), and assistant editors include Phil Baker (NWS San Angelo), Mike Buchanan (NWS Corpus Christi) and Bill Adams (NWS Shreveport). Any corrections or changes to this plan should be brought to the attention of Monte Oaks.

For their contributions and guidance in the preparation of this initial plan, a special thanks should be given to Cynthia Foster (TICC/TFS, Lufkin), Dean Ross (TICC/USFWS, Lufkin), Tom Spencer (TFS, Huntsville), Clint Cross (TFS, Horseshoe Bay), Paul Witsaman (NWS SRH, Fort Worth), Shirley Matejka (NWS, San Angelo), Chuck Maxwell (NWS, Albequerque, NM), and Richard Hitchens (NWS, Houston/Galveston).

II General Information

A. National Weather Service Organization

The primary mission of the NWS is to protect life and property from the damaging effects of hazardous weather. This is accomplished through the issuance of warnings and forecasts targeting primarily the general public. However, through an agreement established between the NWS and wildland fire agencies (see Appendix 4), these warnings and forecasts have been extended to support specific land management and fire protection activities.

To accomplish the mission, NWS offices are staffed continuously by personnel that include one or more professional meteorologists trained in fire weather. Each office provides a specified level of fire weather service based upon requirements established by the fire agencies.

To ensure acceptable two-way communication between the core forecast staff at each office and the various fire agencies, the NWS has designated certain individuals with special knowledge and training to serve as Fire Weather Program Leaders (FWPLs). These meteorologists coordinate the majority of the liaison and administrative activities that are vital to maintaining a close working relationship with the fire community.

The FWPLs for the NWS offices in Texas are listed in the reference guide in Appendix 6 of this operating plan. Queries regarding procedural matters, details of the fire weather program or equipment, special operational needs, et cetera, should be addressed to the program leader of the appropriate NWS office, or to that office's Meteorologist-in-Charge (MIC). Routine fire weather support is provided by the core forecast staff, with program oversight and coordination provided by the program leader. Requests for on-site fire weather support are handled by certified Incident Meteorologists (IMETs) strategically positioned at NWS offices across the country. These requests are coordinated by the Staff Meteorologist at the National Interagency Fire Center (NIFC). *Additional information on obtaining IMET services will be provided in section V of this document.*

B. Communication and Dissemination

Fire weather forecast products from the NWS are transmitted through the Advanced Weather Interactive Processing System (AWIPS). These products are automatically routed into the US Forest Service's Weather Information Management System (WIMS). While the NWS has responsibility to ensure successful transmission through AWIPS and its communications subsystems to the Telecommunications Gateway (TG), it maintains no control over the operation of WIMS. Most products are available on the internet; however, the internet is not sanctioned by the NWS for operational distribution of forecast products.

User agencies should establish a local agreement with the program leader from each NWS office on a reliable means of dissemination. While fire weather watches, red flag warnings and spot forecasts may be posted to NWS office websites, their primary means of dissemination to the wildland fire agencies is through facsimile, electronic mail, or other methods agreed upon between individual NWS offices and the agencies served.

NWS offices should always attempt to coordinate with the Texas Interagency Coordination Center (TICC) if they anticipate a red flag event. TICC will also provide communication and documentation services in the handling of spot forecast requests.

User agencies requesting a change of service or special services from a particular office should submit a formal request to the respective NWS office. A list of office contacts is provided in Appendix 8 at the back of this document.

III Forecast Products Issued by the National Weather Service

A. Routine Fire Weather Forecasts (FWF)

Daily routine fire weather forecasts are available to anyone with an interest in land management and pre-suppression activities in Texas. These forecasts are issued at least once per day in the morning; afternoon updates are considered optional but are issued routinely by some NWS offices.

Routine fire weather forecast content should include (1) a headline to emphasize a red flag warning or a significant change in weather conditions; (2) weather synopsis or map discussion; (3) predictions of sky cover and weather, temperature, humidity, and wind, and thunderstorms and/or precipitation; and (4) an outlook or extended forecast. Additional forecast parameters will be considered optional and will be determined by the individual NWS offices based on the feedback received by their customers.

FWF formats fall into two general categories--narrative and tabular. Examples of narrative and tabular styles are shown in Appendix 4. A brief description of format and content of the fire weather forecasts issued by each office can be found in section VI.

Red Flag Program

The intent of the red flag program is to provide land management agencies with appropriate notification of the likelihood that weather conditions associated with the outbreak of wildfire will occur. Identification of red flag events is a primary responsibility of the forecaster producing the fire weather forecasts. Forecasters will issue a fire weather watch or red flag warning, based on the criteria and timing explained below. Some offices will issue individual products under the product identifier RFW while others will simply highlight the information in the routine fire weather forecast.

1. **Criteria.** The criteria for fire weather watches and red flag warnings across Texas will vary with each NWS office's county warning area based on the vegetation, topography, and distance from the Gulf of Mexico. *Red flag criteria used at individual NWS offices can be found in section VI.* The primary parameters affecting the development of red flag conditions, and thus the ones to be closely evaluated, are relative humidity (including recovery), wind speed, and fuel moisture. Other parameters that also should be considered include the likelihood of lightning occurrence, wind shifts, and/or current

wildfire activity. *It should be noted that few offices with county warning and forecast area (CWFA) responsibilities in Texas have the necessary equipment to evaluate moisture levels. In this case, NWS forecasters should rely on their user agencies to provide them with the most recent measurement of fuel moisture. Since user agencies often have limited operating hours, the forecasters would use the latest moisture data available, which may be measurements recorded on previous days.*

2. **Fire Weather Watch.** Fire weather watches are issued to alert fire and land management agencies to the possibility of red flag conditions beyond the first forecast period (12 hours). The watch is issued generally 12 to 48 hours in advance of the expected conditions, but can be issued up to 72 hours in advance if the forecaster is reasonably confident. The term *FIRE WEATHER WATCH* will be headlined in the routine fire weather forecast and/or issued as a special forecast. The watch will remain in effect until it expires, is canceled, or upgraded to a red flag warning.
3. **Red Flag Warning.** A red flag warning is used to alert fire and land management agencies that red flag conditions exist or are imminent. A red flag warning will be issued immediately when there is high confidence that red flag criteria will occur within the next 24 hours, or if those criteria are already being met. (Due to forecast uncertainty beyond 12 hours, a fire weather watch will be more often used in the 12 to 24 hour time frame.) When a warning is issued, the term *RED FLAG WARNING* will be headlined in the routine fire weather forecast, and/or sent as a special forecast to inform users of the warning. The warning will be continued on subsequent forecasts until no longer valid. A cancellation statement (or headline in the FWF) should terminate the warning unless the previous message indicated a termination time.

C. Spot Forecasts (FWS)

Spot forecasts are site-specific forecasts for wildfires, prescribed burns, search and rescue operations, aerial spraying, etc. By being site-specific, these forecasts take into account the effects of topography, vegetation and any nearby bodies of water. Spot forecasts contain detailed forecast information including sky condition, precipitation and thunderstorm probability, specific maximum and minimum temperature and humidity, and wind speed and direction for the specific area. Spot forecast formats will vary in order to provide the best possible services to the user agencies.

Under Volume 60 of the Federal Register 34, 969 (dated July 5, 1995), <u>non-wildfire forecast support may only be provided to federal agencies</u>. The NWS may not provide routine forecast support to state and local fire management agencies. However, forecast support will always be provided to any requesting agency in support of wildfire activities. *This is why it is imperative that non-federal agencies requesting spot forecasts for a wildfire indicate that it is a wildfire when making the request.*

Spot forecasts are available upon request at any time of day, week or season. Consultation service is also available for planning projects for which weather might be a factor. Requests for spot forecasts shall be serviced by at least one trained meteorologist. These requests will be

completed as soon as possible and should typically take around 30 minutes or less. However, protection agencies should be aware that other duties (such as severe weather) may take higher priority, and short delays may occur. If excessive delays are encountered, please notify the appropriate NWS office. If the spot forecast is to support a wildfire, please inform the forecaster, or annotate the spot request form accordingly.

User agencies should submit spot forecast requests by phone or fax either directly to a NWS office or through the Texas Interagency Coordination Center (TICC). **NOTE: most NWS offices do not use facsimile machines as operational equipment; please call the respective office before sending a request by fax.** Some West Texas NWS offices are set up with a special program enabling them to use the internet as their primary means of receiving, preparing, and returning Spot requests. These forecast have the advantage of being able to be viewed by any interested land management party. See Section VI NWS Weather Forecast offices to see which office have this capability and contact them to coordinate this service.

In non-emergency situations, requesting agencies are encouraged to submit requests by faxing a partially completed (items 1-12) Special Forecast Request Form (WS Form D-1 *See Appendix 5*). Blank copies of WS Form D-1 may be obtained from any NWS office. Emergency requests may be submitted and fulfilled using the most efficient means possible. When listing the location, requests should contain both latitude/longitude coordinates and a local reference. **Once a spot forecast request is fulfilled, NWS offices are encouraged to send a copy of a completed D-1 form to TICC for documentation purposes.** *For additional information on Coordination and Dissemination policies, see Section II.*

In order to make sure that spot forecasts are as accurate as possible, The NWS wishes to develop a verification scheme for spot forecasting in the fiscal year 2001. To assist in this effort, the NWS asks that each spot forecast request be accompanied by a preliminary observation (recorded at the time of the request) and a follow-up observation (recorded at the time of maximum or minimum heating depending upon the time that the request was sent) at the burn site, if possible. User agencies should also understand that preliminary observations are critical to giving the spot forecast a significant improvement from the routine fire weather forecast.

Note: Spot forecasts should not be used as general planning tools for the following day. "Planning" type forecast information should be obtained from the routine fire weather forecast or the zone forecast product, and can be augmented by direct phone consultation with a forecaster on duty at the appropriate NWS office. Spot forecasts are intended to support ongoing or imminent wildfire or federal prescribed burn activity only.

D. Hazardous Weather Outlooks

In times when wildfire activity is expected to threaten lives or property, NWS offices are encouraged to issue Special Weather Statements under the heading of Hazardous Weather Outlook. The decision of when to issue this product is left to the discretion of each forecaster as

well local NWS office policies. Currently the NWS is restricted from using the words "red flag warning" or "fire weather watch" in products distributed to the general public. Additionally, user agencies have requested that the phrase "fire danger" should be avoided unless it makes reference to public statements issued by the US Forest Service/Texas Forest Service.

IV Weather Parameters used in NWS products

The following sections describe the various forecast parameters that are provided in the fire weather forecast products issued by NWS offices having CWFA responsibilities in Texas. *Which parameters are used will be determined by the individual NWS offices as they tailor their services to fit the needs of the user agencies.* NWS offices are obligated to provide user agencies with units of measure and/or a legend to explain ambiguous weather parameters.

A. Weather Trends and Changes

The NWS and the user agencies acknowledges that forecasting drastic weather changes such as fronts, drylines and other wind shifts, and timing of precipitation and thunderstorms is the most critical service that the NWS can provide. These elements all can be described qualitatively in a brief narrative portion of fire weather forecasts called the weather synopsis or map discussion. **Forecasters are strongly encouraged to highlight any weather changes which could pose a threat to land management or fire control efforts in a headline statement preceding the narrative discussion.** Synoptic discussions should focus mainly on **changes** in weather conditions that would impact land management activities and planning.

1. **Wind, humidity and boundary interaction.** A change in wind direction is perhaps the most critical influence on fire control efforts. A wind shift during a Red Flag event could result in loss of life or cost land management agencies and property owners millions of dollars. Subtle changes in wind direction can often lead to changes in humidity, which in turn could have a significant effect on the spread of wildfires. Forecasters are encouraged to forecast the timing of frontal boundaries and wind shifts in the synopsis if they have a reasonable level of confidence. Information on wind, humidity and boundary interaction may also be described in a tabular format, but should be complimented by a narrative discussion if the forecaster expects a complex interaction of boundaries.
2. **Precipitation and thunderstorms.** While being expected to provide precipitation chances based on probability of precipitation (as is provided in the zone forecast product), forecasters are also encouraged to evaluate the likelihood of a wetting rain in the synopsis portion of the forecast. A wetting rain is a widespread rain that over an extended period of time significantly reduces fire danger. NWS fire weather program leaders should ensure their user agencies understand how a wetting rain is discussed in the forecast. *Note: NWS offices needing to decide on specific values to assign to wetting rains for their CWFA should consult with nearby fire behavior specialists.* When thunderstorms are expected, forecasters are encouraged to describe the type of weather that can be expected in or near thunderstorms, i.e. heavy rains, outflow boundaries, dry lightning, etc., in the narrative section of the forecast.

3. **Sky condition.** Sky condition trends discussed qualitatively in the synopsis of a forecast can also give the user agencies a better understanding of how other weather variables will be affected. Sky condition trends may also be described in a tabular assessment expressed as a percentage of sunlight penetrating the clouds in a day or as minutes of sunlight.
4. **Other weather phenomena.** Smoke, fog, and dust expected to create significant problems for wildfire control efforts should be included in the synopsis of the forecast. Severe weather, winter weather, and flash flood events are unlikely to occur during extreme wildfire events but could still be of interest to the user agencies for wildland planning efforts.

B. Winds

Wind speed and direction is generally indicated for the most hazardous part of the day or at other times specified in the forecast. The NOAA/NWS Operational Manual Chapter D-6 states "Users of fire weather forecasts should be made aware of the level for which the wind is forecast, i.e., eye-level, 20 feet, free-air, etc." Maximum gusts, erratic winds, and wind shifts should be mentioned when expected.

1. **20-foot winds.** Winds at 20 feet above the ground or above the average height of vegetation are the most common winds used in the routine fire weather forecast. Since most surface stations used for NWS forecasts measure the wind at 33 feet, a reduction factor is needed to arrive at the 20-foot wind. FTS/RAWS sites, which measure 20 foot wind speed and direction, can be used to compare the 33 foot winds, but are available for only a few NWS offices with responsibilities in Texas.
2. **Eye-level winds.** Eye-level (or 6-foot) winds are often used for spot forecasts to compliment preliminary reports taken at the burn site. These wind forecasts may also be estimated using a reduction factor to the available surface wind data.
3. **Transport winds / ventilation index.**
   Average winds in the mixing layer and the depth of the mixing layer are parameters that are helpful for land management agencies to evaluate the potential for very large fires and also for smoke dispersal. Data computed from morning atmospheric soundings and model forecast soundings are used to provide ventilation values for periods of maximum heating. The following are terms and definitions necessary to understanding ventilation data and values:
   - 3a. Mixing height or mixing depth: The height to which relatively vigorous mixing occurs due to heating. Units are in feet above ground level (AGL), with ground level being the elevation above mean sea level (MSL) of the upper-air site. It is important that wildland fire managers note the difference in elevation between the burn site and the referenced upper-air site, and modify the provided mixing depths accordingly.
   - 3b. Transport winds: A measure of the average rate of the horizontal transport of air within the mixing layer. Units can be expressed in knots (1 knot = 1.15 mph) or mph. An average wind direction (the direction from which the wind is blowing) is provided. If winds are light and variable, then it may be best to consider local

drainage effects when in critical situations.

3c. Ventilation: The product of the mixing height and the transport wind speeds. It is a measure of the volume rate of horizontal transport of air within the mixing layer per unit distance normal to the winds. Units are in knot-feet. As a guide, the following categories have been established to describe the ventilation:

Excellent	150,000 kt-ft or greater
Very Good	100,000-149,999 kt-ft
Good	60,000-99,999 kt-ft
Fair	40,000-59,999 kt-ft
Poor	less than 40,000 kt-ft

When ventilation values are less than 40,000 kt-ft along with transport winds of less than 7.0 knots, dispersion of any pollutants released into the atmosphere will be severely limited.

C. Relative Humidity

Relative humidity is the ratio (expressed in %) of the amount of water vapor actually in the air compared to the amount the air is capable of holding at its temperature and pressure. Since relative humidity values are also critical to fire management activities, they should always be included in routine and spot forecasts. Relative humidity values can vary greatly over a small area due to variations in topography, vegetation and location with respect to bodies of water. Therefore, a range of values will often be used in routine fire weather forecasts, but forecasters should make an attempt to narrow this range when making Spot Forecasts.

D. Lightning Activity Level – A Guide for Fire Weather Observers

			Individual storm cell -cloud to ground lightning discharges		
LAL	Cloud & Storm Development	Areal Coverage	Counts [1]cg / 5 min	Counts cg / 15 min	Average cg / min
1	No thunderstorms	—	—	—	—
2	Cumulus clouds are common but only a few reach the towering stage. A single thunderstorm must be confirmed in the rating area. The clouds mostly produce virga but light rain will occasionally reach ground. Lightning is very infrequent.	<15%	1-5	1-8	<1
3	Cumulus clouds are common. Swelling and towering cumulus cover less than 2/10 of the sky. Thunderstorms are few, but 2 to 3 occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	15% to 24%	6-10	9-15	1-2

4	Swelling cumulus and towering cumulus cover 2-3/10 of the sky. Thunderstorms are scattered but more than three must occur within the observation area. Moderate rain is commonly produced, and lightning is frequent.	25% to 50%	11-15	16-25	2-3
5	Towering cumulus and thunderstorms are numerous. They cover more than 3/10 and occasionally obscure the sky. Rain is moderate to heavy, and lightning is frequent and intense.	>50%	>15	>25	>3
6	Dry lightning outbreak. (LAL of 3 or greater with majority of storms producing little or no rainfall.)		—	—	—

[1] Cloud-to-ground lightning discharges

E. Haines Index

The Haines Index (HI) is a numerical value that indicates the potential for large wildfires to experience extreme fire behavior (i.e. crowning, spotting, and rapid rates of spread). The HI combines both the instability and dryness of the air by examining the lapse rate between two pressure levels in the atmosphere and the dryness at one of the pressure levels. There are three different methods of computing HI depending upon whether the area elevation is considered low, medium or high. Each NWS office determines the elevation which is most suitable for their area of responsibility. For each elevation, Haines Index classifications are assigned to values 2 through 6 as shown below:

Haines Index	Potential for Large Fire Growth
2 or 3	Very Low
4	Low
5	Moderate
6	High

The HI numbers are computed for each elevation using the following parameters:

HI	=	STABILITY TERM (A)	+	MOISTURE TERM (B)
Low Elevation HI	=	950-850 MB TEMP A=1 when 3 deg C or less A=2 when 4-7 deg C A=3 when 8 deg C or more	+	850 MB TEMP-DEW POINT B=1 when 5 deg C or less B=2 when 6-9 deg C B=3 when 10 deg C or more
Mid Elevation HI	=	850-700 MB TEMP A=1 when 5 deg C or less	+	850 MB TEMP - DEW POINT B=1 when 5 deg C or less

	A=2 when 6-10 deg C or less		B=2 when 6-12 deg C or less
	A=3 when 11 deg C or more		B=3 when 13 deg C or more
High Elevation HI =	700-500 MB TEMP	+	700 MB TEMP - DEW POINT
	A=1 when 17 deg C or less		B=1 when 14 deg C or less
	A=2 when 18-21 deg C		B=2 when 15-20 deg C
	A=3 when 22 deg C or more		B=3 when 21 deg C or more

F. Inversion Burn-off

Information on inversion burn-off time and/or temperature is an optional forecast parameter that many user agencies may request. Since eroding inversions are often highly variable over a small area, forecast inversion burn-off times and temperatures will be most accurate and useful when used in site-specific weather forecasts.

IV Special Services

Special meteorological services are those requiring a meteorologist to be away from the Forecast Office, and/or, in non-emergency situations to be on overtime. Special services include Air Transportable Mobile Unit (ATMU) staffing and other on-site meteorological services such as weather observer training, weather station visits, and training requested by other user agencies.

User agencies such as the USDA or Texas Forest Service are responsible for paying overtime, travel, and per diem costs for special services. Costs to be recovered from the user are calculated on the basis of expense reports submitted by the Forecast Office to NWS Southern Region Headquarters. Billing of the user agencies is handled by the appropriate NWS administrative division based on the expense report. Bills include a statement of services rendered, as well as the dates and locations of services provided.

A. The Air Transportable Mobile Unit (ATMU)

The ATMU is stored and dispatched from several sites in the western U.S. or from the USDA Fire Cache in London, Kentucky. The ATMU is available upon request for duty at an incident fire, a critical prescribed burn, or other weather-sensitive incident in southeast Texas.

Each ATMU consists of seven pieces or modules, weighing a total of 355 pounds and occupying a total of 34.2 cubic feet. The unit comes equipped with an automatic weather station, theodolite with tripod and calculator for computing winds aloft, a belt weather kit, satellite receiving and display equipment for weather graphics, data communications equipment, a nozzle and regulator for the helium tank, plus office supplies and miscellaneous expendables.

The ATMU must be set up and operated by an ATMU certified meteorologist (called an incident meteorologist or IMET) working closely with a Fire Behavior Analyst (FBA) or Planning Section Chief.

Requests for ATMUs and IMETs should be made through the US Forest Service Regional Dispatch. As a rule, the requests for most of Texas (east of 100 degrees longitude) come from the Southern Area Coordination Center (SACC). West of 100 degrees, they should come through the Southwest Area Coordination Center (SWACC). The Fire Weather Focal Point or Meteorologist-in-Charge at NWS offices should be made aware of the need for ATMU and IMET services in their County Warning and Forecast Area (CWFA).

B. Fire Weather Training

National Weather Service fire weather meteorologists are available to assist fire control agencies with training at fire behavior school and other related courses. Requests for assistance should be forwarded to the Meteorologist-in-Charge (MIC) at the respective NWS office(s) by written letter.

VI NWS Weather Forecast Offices

Each NWS weather forecast office providing service in the state of Texas is staffed with meteorologists trained in fire weather forecasting around the clock, 365 days a year. This section will discuss the varieties of services provided by each NWS Office and the geographical areas for which NWS offices are responsible.

Questions or concerns regarding the policies outlined in this section should be directed to the fire weather program leader (FWPL) and/or the MIC of the respective NWS office(s). Additional details on specific services provided by a NWS office will be provided in the Local Area Operating Plan (LAOP) for that office. A map of the county warning and forecast areas for each NWS office and relation with surrounding areas is provided in appendix 2.

NWS AMARILLO

Forecast Area

The Amarillo Weather Forecast Office located in Amarillo has a responsibility of providing fire weather information for the following counties in the Texas Panhandle:

Armstrong	Donley	Hutchinson	Potter
Carson	Gray	Lipscomb	Randall
Collingsworth	Hansford	Moore	Roberts
Dallam	Hartley	Ochiltree	Sherman
Deaf Smith	Hemphill	Oldham	Wheeler

Federal Land Management Agencies Served

National Park Service (Alibates Flint Quarries National Monument and Lake Meridith National Recreation Area)

U.S. Fish and Wildlife Service (Buffalo Lake National Wildlife Refuge)

U.S. Forest Service (Black Kettle National Grassland, McClellan Creek National Grassland and Rita Blanca National Grassland)

Red Flag Criteria
RFW criteria for the Texas panhandle are a minimum relative humidity equal to or less than 20 percent, average sustained wind speeds of 20 mph or higher, temperatures of 60 degrees Fahrenheit or higher, and 10-Hour Dead Fuel Moisture Contents of less than 5 percent (taken from the NPS Lake Meredith WIMS daily report). The wind criteria is met when the public forecast (LBBZFPAMA) calls for winds of 15 to 25 mph or more. Another criteria for issuing RFW's is when there are ongoing wildfires in the Texas panhandle.

Fire Weather Products Issued
Fire Weather Forecast (product identifier LBBFWFAMA; WMO Header FNUS54 KAMA): These forecasts will be issued routinely once a day at around 7 am. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers forecast as an additional parameter.

Fire Weather Watch/Red Flag Warning (product identifier LBBRFWAMA; WMO Header WWUS84 KAMA): This is an event driven product which elaborates on the weather conditions which support extreme fire behavior. The information provided in this product should also be found in the routine fire weather forecast.

NWS AUSTIN/SAN ANTONIO

Forecast Area
The Austin/San Antonio Weather Forecast Office located in New Braunfels has a responsibility of providing fire weather information for the following counties in South Central Texas:

Atascosa	Caldwell	Frio	Kendall	Maverick	Williamson	
Bandera	Comal	Gillespie	Kerr	Medina	Wilson	
Bastrop	Dewitt	Gonzales	Kinney	Real	Zavala	
Bexar	Dimmit	Guadalupe	Lavaca	Travis		
Blanco	Edwards	Hays	Lee	Uvalde		
Burnet	Fayette	Karnes	Llano	Val Verde		

Federal Land Management Agencies Served
U.S. Fish and Wildlife Service (Balcones Canyonlands National Wildlife Refuge)
National Park Service (Amistad National Recreation Area and Lyndon B. Johnson and San Antonio Missions National Historical Parks)

Red Flag Criteria
Expected sustained 20 ft wind speeds of 15 mph or greater or 10 mph or greater if humidity is below criteria prior to a wind shift of 45 degrees or more. Minimum daytime humidity should

be less than 25%, and maximum humidity recovery should be less than 60%. Note: Since wind speed forecasts are based on 33 foot wind observations, the criteria for fire weather watches and red flag warnings should be adjusted to 20 foot by multiplying winds from surface reports (METARs) by 0.7. Other criteria include presence of dry lightning (LAL=6) and extremely low fuel moisture. Thunderstorms containing dry lightning combined with drought conditions could produce extreme fire behavior on days when winds and relative humidity are not at critical levels.

Fire Weather Products Issued

Fire Weather Forecast (product identifier SATFWFEWX; WMO Header FNUS54 KEWX): These forecasts will be issued routinely either once or twice a day–first issued at around 7 am and updated around 330 pm during the dry season. Dry seasons are evaluated periodically by coordinating TICC to determine the necessity of an afternoon issuance. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, these routine fire weather forecasts offer additional parameters for the selected cities of Austin, Del Rio and San Antonio. These parameters include LAL, maximum height of the mixing layer (feet AGL), mean transport wind speed (miles/hour) and direction in the mixing layer, and low level HI. These additional parameters are offered for the first weather day in the 7 am forecast and for the following afternoon in the 330 pm update.

NWS BROWNSVILLE

Forecast Area

The Brownsville Weather Forecast Office located in Brownsville has a responsibility of providing fire weather information for the following counties in Deep South Texas:

Brooks	Hidalgo		Kenedy	Zapata
Cameron	Jim Hogg	Starr		

Federal Land Management Agencies Served

National Park Service (Padre Island National Seashore)
U.S. Fish and Wildlife Service (Laguna Atascosa and Santa Ana National Wildlife Refuges)

Red Flag Criteria

Expected sustained 20 ft wind speeds of 20 mph or greater or 15 mph or greater if humidity is below criteria prior to a wind shift of 45 degrees or more. Minimum daytime humidity should be less than 35%, and maximum humidity recovery should be less than 70%. Note: Since wind speed forecasts are based on 33 foot wind observations, the criteria for fire weather watches and red flag warnings should be adjusted to 20 foot by multiplying winds from surface reports (METARs) by 0.7. Other criteria include presence of dry lightning (LAL=6) and extremely low fuel moisture. Thunderstorms containing dry lightning combined with drought conditions could produce extreme fire behavior on days when winds and relative humidity are not at critical levels.

Fire Weather Products Issued
Fire Weather Forecast (product identifier SATFWFBRO; WMO Header FNUS54 KBRO): These forecasts will be issued routinely once a day at around 7 am. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers forecast precipitation amounts, maximum height of the mixing layer (feet AGL), mean transport wind speed (miles/hour) and direction in the mixing layer, and Keetch-Byram Index.

Fire Weather Watch/Red Flag Warning (product identifier SATRFWBRO; WMO Header WWUS84 KBRO): This is an event driven product which elaborates on the weather conditions which support extreme fire behavior. The information provided in this product should also be found in the routine fire weather forecast.

NWS CORPUS CHRISTI

Forecast Area
The Corpus Christi Weather Forecast Office located in Corpus Christi has a responsibility of providing fire weather information for the following counties in the Coastal Bend and Rio Grande Plains of South Texas:

Aransas	Duval	Kleberg	McMullen	San Patricio
Bee	Goliad	La Salle	Nueces	Victoria
Calhoun	Jim Wells	Live Oak	Refugio	Webb

Federal Land Management Agencies Served
U.S. Fish and Wildlife Service (Aransas National Wildlife Refuge)
National Park Service (Padre Island National Seashore)

Red Flag Criteria

Red Flag criteria for the Coastal Counties:	***Red Flag criteria for the Inland Counties:***
Relative Humidities at or below 40%	Relative Humidities at or below 30%
20-Foot winds at or above 25 mph	20-Foot winds at or above 25 mph

These combinations of low RH and strong winds have been determined to be critical to wildfire potential and growth across South Texas.

A Red Flag Warning may also be issued if one of the following conditions occur:

1.) Any weather changes in the JUDGEMENT of the fire weather forecaster that would increase the fire danger, start new fires or present control problems to ongoing fires.

2.) 20-Foot winds at or above 25 mph along with a wind direction of Northeast. **(Aransas County Only)**
3.) Relative Humidities at or below 40% along with a wind direction of Northeast. **(Aransas County Only)**

Since most of the fuels which carry a fire in South Texas are 1-hour fuels (grasses), then antecedent moisture is not as important.

Fire Weather Products Issued
Fire Weather Forecast (product identifier SATFWFCRP; WMO Header FNUS54 KCRP): These forecasts will be issued routinely once a day at around 8 am. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers forecast precipitation amounts, expected duration of precipitation, likelihood of fog, maximum height of the mixing layer (feet AGL), and mean transport wind speed (miles/hour) and direction in the mixing layer.

Fire Weather Watch/Red Flag Warning (product identifier SATRFWCRP; WMO Header WWUS84 KCRP): This is an event driven product which elaborates on the weather conditions which support extreme fire behavior. The information provided in this product should also be found in the routine fire weather forecast.

NWS EL PASO AREA

Forecast Area
The El Paso Weather Forecast Office located in Santa Teresa, NM has a responsibility of providing fire weather information for the following counties in Far West Texas:

El Paso Hudspeth

Federal Land Management Agencies Served
National Park Service (Chamizal National Memorial Park)

Red Flag Criteria
RFW criteria for the El Paso NWS office must conform to the following requirements from the Southwest Area Fire Weather Operating Plan:

-20 foot wind speeds of 20 mph or greater
-Relative Humidity of 15 percent or less
-NFDRS rating of HIGH or greater.

Note: A separate RFW product is not issued. When conditions warrant the need for a RFW the scheduled Fire Weather Forecast will be headlined. If a RFW is deemed necessary after the FWF is issued, an updated FWF, with headlines, will be issued. The Gila and Lincoln Zone Dispatch Centers will be notified.

Fire Weather Products Issued
Fire Weather Forecast (product identifier LBBFWFEPZ; WMO Header FNUS54 KEPZ):

In season (approximately May 1st - Oct 31st):
These forecasts will be issued routinely twice a day–first issued around 930 am and again at around 230 pm. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers forecast probability of a wetting rain, relative humidity, LAL, high-level HI, and 10000 foot winds (knots).

Off Season (approximately Nov. 1st - Mar 31st):
The FWF is issued once daily around 930 am. The off-season format discontinues LAL and HI. Maximum height of the mixing layer (feet AGL), and mixing layer transport winds are added to aide in smoke dispersal decisions.

Special Spot Forecast Services
The El Paso NWS office is set up with a special program enabling them to use the internet as their primary means of receiving, preparing, and returning Spot requests. These forecast have the advantage of being able to be viewed by any interested land management party.

NWS FORT WORTH/DALLAS

Forecast Area
The Fort Worth/Dallas Weather Forecast Office located in Fort Worth has a responsibility of providing fire weather information for the following counties in North Texas:

Anderson	Delta	Grayson	Johnson	Mills	Stephens
Bell	Denton	Hamilton	Kaufman	Montague	Somervell
Bosque	Eastland	Henderson	Lamar	Navarro	Tarrant
Collin	Ellis	Hill	Lampasas	Palo Pinto	Van Zandt
Commanche	Erath	Hood	Leon	Parker	Wise
Cooke	Falls	Hopkins	Limestone	Rains	Young
Coryell	Fannin	Hunt	McLennan	Robertson	
Dallas	Freestone	Jack	Milam	Rockwall	

Federal Land Management Agencies Served
U.S. Fish and Wildlife Service (Hagerman National Wildlife Refuge)
U.S. Forest Service (Caddo and Lyndon B. Johnson National Grasslands)

Red Flag Criteria
Wind advisory winds of 20-30 mph, minimum humidity levels of 20 percent or less, dry thunderstorms, and ongoing large wildfires.

Fire Weather Products Issued

Fire Weather Forecast (product identifier FTWFWFFTW; WMO Header FNUS54 KFWD): Fire weather forecasts from the Fort Worth/Dallas NWS office are issued twice a day–the first issuance in the morning between 7 and 8 am and the latter an update between 3 and 4 pm. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers additional parameters, including height of the mixing layer (meters AGL), mean transport wind speed (meters/second) and direction in the mixing layer, expected hours of sunshine, and fog potential.

North Texas Grass Fire Danger Statement (product identifier FTWFWMFTW; WMO Header FNUX76 KFWD): This is an event driven product which elaborates on the weather conditions which support the issuance of a red flag warning or fire weather watch. The information provided in this product should also be found in the routine fire weather forecast.

NWS HOUSTON/GALVESTON

Forecast Area

The Houston/Galveston Weather Forecast Office located in Dickinson has a responsibility of providing fire weather information for the following counties in Southeast Texas:

Austin	Colorado	Houston	Montgomery	Waller
Brazoria	Fort Bend	Jackson	Polk	Washington
Brazos	Galveston	Liberty	San Jacinto	Wharton
Burleson	Grimes	Madison	Trinity	
Chambers	Harris	Matagorda	Walker	

Federal Land Management Agencies Served

National Park Service (Big Thicket National Preserve)

U.S. Fish and Wildlife Service (Anahuac National Wildlife Refuge, Attwater Prairie Chicken National Wildlife Refuge and Big Boggy/Brazoria/San Bernard National Wildlife Refuges)

U.S. Forest Service (Davy Crockett and Sam Houston National Forests)

Red Flag Criteria

Fire Weather Watches and Red Flag Warnings are issued in coordination with the USDA Forest Service/TICC in Lufkin. This is an indication that fire activity could be enhanced because of low humidity and high winds. Prescribed burning is not recommended on red flag days.

When low humidity (20-25 percent or less) is expected to combine with high winds (15 to 25 mph sustained or higher), and fuel moistures are low, a FIRE WEATHER WATCH will be issued if these conditions are forecast within 12 to 24 hours. A RED FLAG WARNING will be

issued when these conditions are occurring or expected within 12 hours. We do not issue a

separate product for either a FIRE WEATHER WATCH or RED FLAG WARNING at this time. The issuance will simply be headlined at the top of the daily Fire Weather Forecast.

Fire Weather Products Issued
Fire Weather Forecast (product identifier SATFWFHGX; WMO Header FNUS54 KHGX): Fire weather forecasts from the Houston/Galveston NWS office are issued twice a day–the first issuance in the morning at around 730 am and the latter an update at around 330 pm. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers additional parameters, including hours of sunshine, fog potential, height of the mixing layer (meters AGL), mean transport wind speed (meters/second) and direction in the mixing layer, Burn-off Temperature at 500 Meters AGL and Transport wind speed (meters/second) and direction at 500 Meters AGL.

NWS LAKE CHARLES, LA

Forecast Area
The Lake Charles Weather Forecast Office located in Lake Charles, LA has a responsibility of providing fire weather information for the following counties in Extreme Southeast Texas:

Hardin	Jefferson	Orange
Jasper	Newton	Tyler

Federal Land Management Agencies Served
National Park Service (Big Thicket National Preserve)
U.S. Fish and Wildlife Service (McFaddin and Texas Point National Wildlife Refuges)

Red Flag Criteria
In general, Fire Weather Watches and Red Flag Warnings will be issued when sustained winds of 20 to 25 mph or greater are expected while the region is at Preparedness Level 2 or greater. Preparedness Level 2 or higher in the Gulf Coast Area means that fuels are sufficiently dry and RH values are usually low enough (>30 to 35%) or strong winds to cause erratic and extreme fire behavior.

Fire Weather Products Issued
Fire Weather Forecast (product identifier NEWFWFLCH; WMO Header FNUS54 KLCH): Fire weather forecasts from the Lake Charles NWS office are issued twice a day–the first issuance in the morning at around 6 am and the latter an update at around 2 pm. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers additional parameters, including precipitation amount, precipitation timing and duration, lightning frequency, maximum and minimum mixing heights (feet AGL), ceiling heights, mean transport wind speed (miles/hour) and direction in the mixing layer, dispersion index, ventilation rate (knot-feet), category day, and Keetch-Byram Index.

NWS LUBBOCK

Forecast Area

The Lubbock Weather Forecast Office located in Lubbock has a responsibility of providing fire weather information for the following counties in the South Plains of Northwest Texas:

Bailey	Cottle	Hale	Lamb	Stonewall
Brisco	Crosby	Hall	Lubbock	Swisher
Castro	Dickens	Hockley	Lynn	Terry
Childress	Floyd	Kent	Motley	
Cochran	Garza	King	Parmer	

Federal Land Management Agencies Served

U.S. Fish and Wildlife Service (Muleshoe National Wildlife Refuge)

Red Flag Criteria

RFW criteria for the Lubbock NWS office must conform to the following requirements from the Southwest Area Fire Weather Operating Plan:

-20 foot wind speeds of 20 mph or greater
-Relative Humidity of 15 percent or less
-NFDRS rating of HIGH or greater

Fire Weather Products Issued

Fire Weather Forecast (product identifier LBBFWFLUB; WMO Header FNUS54 KLUB): These forecasts will be issued routinely once a day at around 7 am. Format: Tabular with narrative Synopsis and Extended Forecast. Forecast parameters: Cloud Amount, Probability of Precipitation, Type of Precipitation, Max/Min Temperatures, Wind Direction, 20 Foot Wind Speed, Max/Min Relative Humidity and Haines Index.

Fire/Grassland Danger Statement (issued under the heading of "special weather statement"; product identifier LBBSPSLBB; WMO header WWUS84 KLUB): This product is issued on an as needed basis.

NWS MIDLAND/ODESSA

Forecast Area

The Midland/Odessa Weather Forecast Office located in Midland has a responsibility of providing fire weather information for the following counties in West Texas:

Andrews	Dawson	Jeff Davis	Pecos	Terrell
Borden	Ector	Loving	Presidio	Upton
Brewster	Gaines	Martin	Reagan	Ward

Crane	Glasscock	Midland	Reeves	Winkler
Culberson	Howard	Mitchell	Scurry	

IMET Qualified Forecaster: Greg Murdoch

Federal Land Management Agencies Served

National Park Service (Big Bend National Park, Fort Davis National Historic Site and Guadalupe Mountains National Park)

Red Flag Criteria

RFW criteria for the Midland/Odessa NWS office must conform to the following requirements from the Southwest Area Fire Weather Operating Plan:

-20 foot wind speeds must attain a 10 minute time average of 20 mph or greater (RAWS)
-Relative Humidity of 15 percent or less
-NFDRS rating of HIGH or greater.

Fire Weather Products Issued

Fire Weather Forecast (product identifier LBBFWFMAF; WMO Header FNUS54 KMAF):
NWS Midland/Odessa issues routine fire weather forecast for the mountains of Southwest Texas. These forecasts are issued twice daily generally no later than 1030 am and 330 pm local during the "fire weather season". The "fire weather season" for the Midland/Odessa NWS office is considered between March 1 and November 1. In the "off season" the FWF is issued once a day no later than 1030 am local. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers additional parameters, including percent chance of a wetting rain, 10,000 foot free air winds, lightning activity level, Haines Indices (using a mix of mid and high levels depending on the time of year), and ventilation data are also included during the "in season". The "off season" format varies slightly and is in support of prescribe burns. The "off season" format includes the parameters 10,000 ft free air winds, relative humidity, and ventilation data only.

NFDRS Forecasts

NWS Midland/Odessa is responsible for NFDRS zone 350 in southeast New Mexico and the Texas portion of zone 364, which includes the Guadalupe Mountains NP. In order for the forecaster to issue a forecast, an observation must be received. Individual station trends forecast are issued in zone 364 so there is no conflict with the zone trend forecast for 364 issued by El Paso and zone trends are provided for zone 350. Site forecasts are also provided for the Chisos Basin and Panther Junction sites in the Big Bend NP. NFDRS forecasts are issued only during the fire weather season. Additional information on NFDRS forecasts will be provided in the LAOP for the Midland/Odessa office.

NWS OKLAHOMA CITY/NORMAN, OK

Forecast Area

The Oklahoma City/Norman Weather Forecast Office located in Norman, OK has a responsibility of providing fire weather information for the following counties in North Texas:

Archer	Clay	Hardeman	Wichita
Baylor	Foard	Knox	Wilbarger

Red Flag Criteria
Criteria has not been established.

Fire Weather Products Issued
Fire Weather Forecast (product identifier OKCFWFOKC; WMO Header FNUS54 KOUN):
Routinely issued twice per day at 445 am and 415 pm. Includes the following parameters: cloud cover, max/min temperature, max/min humidity, AM/PM wind (mph), precipitation type and chances, mixing height (m), transport winds (m/s), and ventilation rate. It also includes the extended forecast for days 3 thru 7.

Fire Danger Statement (product identifier OKCFWMOKC; WMO Header FXUS76 KOUN):
Fire Danger Statements are issued on an as needed basis, when there is either a very high or extreme fire danger. These conditions are determined and are based on stage of vegetation, expected afternoon high temperature, afternoon minimum relative humidity and daytime wind speed. Also included in the product are any burning bans that may be currently in effect.

NWS SAN ANGELO

Forecast Area
The San Angelo Weather Forecast Office located in San Angelo has a responsibility of providing fire weather information for the following counties in West Central Texas:

Brown	Crockett	Kimble	Runnels		Sutton
Callahan	Fisher	Mason	San Saba	Taylor	
Coke	Haskell	McCulloch	Schleicher	Throckmorton	
Coleman	Irion	Menard	Shackelford	Tom Green	
Concho	Jones	Nolan	Sterling		

Federal Land Management Agencies Served
United States Department of Agriculture (Natural Resources Conservation Service)

Red Flag Criteria
Red Flag Warnings are issued when minimum afternoon relative humidity is forecast to fall below 20 percent and sustained 20 foot winds equal or exceed 18 mph (25 mph at the 33 foot ASOS anemometer level). Sufficient dead fuel availability is also a requirement.

Fire Weather Products Issued

Fire Weather Forecast (product identifier LBBFWFSJT; WMO Header FNUS54 KSJT): Routinely issued every day of the year. Issuance times: 5 A.M. Central Time; updated 2 P.M. Central Time. Format: Tabular with Synopsis and narrative Extended Forecast. Forecast parameters: Cloud Amount, Probability of Precipitation, Precipitation Type, Max/Min Temperature, Wind Direction, 20 Foot Wind Speed, Max/Min Relative Humidity, Mixing Height, Transport Direction, Transport Speed.

NWS SHREVEPORT, LA

Forecast Area
The Shreveport Weather Forecast Office located in Shreveport, LA has a responsibility of providing fire weather information for the following counties in East Texas:

Angelina	Franklin	Nacogdoches	San Augustine Wood
Bowie	Gregg	Panola	Shelby
Camp	Harrison	Red River	Smith
Cass	Marion	Rusk	Titus
Cherokee	Morris	Sabine	Upshur

Federal Land Management Agencies Served
U.S. Forest Service (Angelina and Sabine National Forests)

Red Flag Criteria
Weather conditions which warrant issuance of these products are strong wind with low relative humidity (generally 25 mph or higher with less than 25 percent relative humidity), lightning risk, and fire danger in the high or extreme categories.

Fire Weather Products Issued
Fire Weather Forecast (product identifier NEWFWFSHV; WMO Header FNUS54 KSHV): Fire weather forecasts from the Shreveport NWS office are issued twice a day–the first issuance in the morning at around 7 am and the latter an update at around 3 pm. In addition to the required forecast parameters and information on any fire weather watches and red flag warnings in effect, the routine fire weather forecast offers additional parameters, including precipitation amount, precipitation duration, 500 m/1700 ft mixing height temperatures, maximum and minimum mixing heights (meters and feet MSL), mean transport wind speed (meters/second and miles/hour) and direction in the mixing layer, ventilation index, and category day.

Appendix 1: Glossary of Fire Weather Terms

Active crown fire: A fire in which a solid flame develops in the crowns of trees.

Aerial fuels: Standing and supported live and dead combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, cones, bark and vines.

Air Transportable Modular Unit (ATMU): A weather data collection and forecasting facility used by an IMET.

Automated Surface Observing System (ASOS): The computer system which produces most of the National Weather Service surface observations.

Aspect: Direction toward which a slope faces.

Available fuel: That portion of the total fuel that would actually burn under various environmental conditions.

Advance Weather Interactive Processing System (AWIPS): The main computer system that the National Weather Service uses to compose and transmit its forecasts and warning.

Backfire: A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convective column.

Backing wind: Wind that changes direction in a counter clockwise motion.

Blowup: A sudden increase in fireline intensity or rate of spread of a fire sufficient to preclude direct control or to upset existing suppression plans. This is often accompanied by violent convection.

Burning index: An estimate of the potential difficulty of fire containment as it relates to the flame length at the head of the fire.

Burn-off temperature at 500 meters: The forecast temperature at the time in which the mixing height is expected to reach 500 meters.

Carrier fuels: The fuels that support the flaming front of the moving fire.

Chain: A unit of measure equal to 66 feet (20 meters).

County Warning and Forecast Area (CWFA): The area in which a NWS office is responsible for issuing forecasts and warnings.

Compactness: Spacing between fuel particles.

Creeping fire: A fire burning with a low flame and spreading slowly.

Crown fire: A fire that advances from top to top of trees or shrubs more or less independent of a surface fire.

Dead fuels: Fuels with no living tissue in which moisture content is governed entirely by absorption or evaporation of atmospheric moisture.

Dispersion: The decrease in concentration of airborne pollutants as they spread throughout an increasing volume of atmosphere.

Drainage wind: Normal nighttime airflow directed downslope or downvalley, caused by cooling of the air near the earth's surface. Air sinking toward lower elevations is usually quite gentle (light) in nature.

Dry lightning: A thunderstorm in which little if any precipitation occurs at the ground.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles and leaves and immediately above the mineral soil.

Effective windspeed: The midflame windspeed adjusted for the effect of slope on fire spread.

Equilibrium moisture content: Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity.

Extreme fire behavior: Fire behavior characterized by one or more of the following...high rate of spread...prolific crowning and/or spotting...presence of fire whirls...strong convection column.

Eye-level (six-foot) wind: Wind measured at eye level by a hand-held wind meter. These winds are affected by vegetation and terrain and are often used as mid-flame wind.

Fine fuel moisture: The moisture content of fuels such as grass, leaves, ferns, tree moss, pine needles and small twigs.

Fine (light) fuels: Fast-drying dead fuels, generally characterized by a high surface area-to-volume ratio. They have diameters 1/4 inch or less. These fuels (grass, leaves, needles, etc.) Ignite readily and are consumed rapidly by fire when dry.

Fire behavior: The manner in which a fire reacts to the influences of fuel, weather and topography.

Fire behavior forecast: A prediction of probable fire behavior, usually prepared by a fire behavior analyst in support of fire suppression or prescribed burning operations.

Fire Behavior Prediction System (FBPS): A system that uses a set of mathematical equations

to predict certain aspects of fire behavior in wildland fuels when provided with data on fuel and environmental conditions.

Fire behavior analyst: Person responsible to the planning section chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather and topography.

Firebrand: Any source of heat, natural or human made, capable of igniting wildland fuels.

Fire danger: A general term used to express an assessment of fixed and variable factors such as fire risk, fuels, weather and topography which influence whether fires will start, spread and do damage; also the degree of control difficulty to be expected.

Fire danger rating: A fire management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices of current protection needs.

Fire front: The part of a fire within which continuous flaming combustion is taking place.

Fire season: Period(s) of the year during which wildland fire are likely to occur, spread and affect resources value sufficient to warrant organized fire management activities.

Fire storm: Violent convection caused by a large continuous area of intense fire.

Fire weather: Weather conditions which influence fire ignition, behavior and suppression.

Fire weather service area: A geographical area of responsibility for which the local National Weather Service office provides fire weather products.

Fire weather watch: A NWS product used to alert fire fighting officials of a potential critical fire weather situation.

Fire whirl: Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris and flame.

Flame depth: The depth of the fire front.

Flame height: The average maximum vertical extension of flames at the leading edge of the fire front.

Flame length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame; an indicator of fire intensity.

Flare-up: Any sudden acceleration in rate of spread or intensification of the fire.

Flash fuels: Fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash which ignite readily and are consumed rapidly when dry.

Forecast periods:

Today	Sunrise to sunset
This afternoon	Noon to 6 pm
Tonight	Sunset to sunrise
Tomorrow	6 am to 6 pm of the following day

Free-air wind: The wind above ground level and not influenced by terrain, vegetation, etc.

Fuel: Combustible material.

Fuel class: A group of fuels possessing common characteristics.

Fuel group: An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics. General fuel groups are grass, brush, timber and slash.

Fuel moisture: The amount of water in a fuel, expressed as a percentage of the ovendry weight of that fuel.

Fuel moisture indicator stick: A specially prepared stick of known dry weight continuously exposed to the weather and periodically weighed to determine changes in moisture content as an indication of moisture changes in wildland fuels.

General fire weather forecast (FWF): A forecast, issued daily during the fire season, that is intended for planning purposes by land management agencies. Also called routine fire weather forecast or simply fire weather forecast.

Ground fire: Fire that consumes the organic material beneath the surface litter on the ground.

Gust: A sudden, brief increase in the speed of the wind.

Haines Index (HI): An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air.

Head fire: A fire spreading or set to spread with the wind.

Heavy fuels: Fuels of large diameter such as logs which ignite and are consumed more slowly than flash fuels.

Holdover fire: A fire that remains dormant for a considerable time.

Hot spot: A particularly active part of a fire.

Humidity recovery: The change in relative humidity over a given period of time generally between late evening and sunrise.

Ignition probability: The chance that a firebrand will cause an ignition when it lands on receptive fuels.

Ignition temperature: The lowest temperature of a substance at which sustained combustion can be initiated.

Incident Meteorologist (IMET): A specially trained meteorologist who provides site specific weather forecasts and information to fire fighting field personnel.

Independent crown fire: A fire that advances in the tree crowns alone, not requiring any energy from the surface fire to sustain combustion or movement.

Initial attack: The actions taken by the first resources to arrive at a wildfire in order to protect life and property, and prevent further extension of the fire.

Inversion: An increase of temperature with height in the atmosphere.

Keetch-Byram Drought Index (KBDI): A drought index specifically for fire management applications. It has a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

Light fuels: See fine fuels.

Lightning Activity Level (LAL): A number, on a scale from 1 to 6, which reflects frequency and character of cloud-to-ground lightning. The scale from 1 to 5 deal with wet thunderstorms with 5 representing numerous thunderstorms with frequent lightning. 6 represents dry lightning.

Litter: The top layer of forest floor, composed of loose debris of dead sticks, branches, twigs and recently fallen leaves or needles.

Live fuel moisture: Ratio of the amount of water to the amount of dry plant material in living plants.

Live fuels: Living plants, such as trees, grasses and shrubs.

Long-range spotting: Large glowing firebrands are carried high into the convective column and then fall out downwind beyond the main fire starting new fires.

Micro-Remote Environmental Monitoring System (MICRO-REMS): A mobile weather monitoring station.

Mid-flame wind: The wind that acts directly on the flaming fire front at a level one-half the flame height.

Mixing height: The depth measured from the surface in which vigorous atmospheric mixing occurs. The mixing height is found at the base of an inversion.

Moisture of extinction: The fuel moisture content at which the fire will not spread.

National Fire Danger Rating System (NFDRS): A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

National Interagency Fire Center (NIFC): A facility located in Boise, ID, jointly operated by several federal agencies, dedicated to coordination, logistical support and improved weather services in support of fire management operations throughout the United States.

Offshore flow: Wind blowing from land to water.

One-hour fuel moisture: Moisture content of fine fuels.

One-hundred hour fuel moisture: The moisture content of dead fuels which have diameters between 1 and 3 inches.

One-thousand hour fuel moisture: The moisture content of dead fuels which have diameters between 3 and 8 inches.

Onshore flow: Wind blowing from water to land.

Outflow boundary: A surface boundary that is produced by thunderstorm winds.

Palmer Index: A long-term drought index which measures the moisture supply. The index is used primarily for agricultural and hydrologic concerns since it deals with evapotranspiration, soil recharge, runoff and moisture loss from the surface layer. +4 or higher means extremely wet while -4 or less means extreme drought.

Passive crown fire: A fire in the crowns of trees in which trees or groups of trees torch, ignited by the passing front of the front.

Plume-dominated wildfire: A wildland fire whose activity is determined by the convection column.

Prescribed burn: Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions, which allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain

planned fire treatment and resource management objectives.

Pressure gradient: The change in atmospheric pressure per unit distance. The greater the change in pressure per unit distance, the stronger the pressure the pressure gradient and the stronger the wind.

Presuppression: Activities in advance of fire occurrence to ensure effective suppression action. These activities include planning the organization, recruiting and training, procuring equipment and supplies, maintaining fire equipment and fire control improvements and negotiating cooperative and/or mutual aid agreements.

Probability of ignition: The chance that a firebrand will cause an ignition when it lands on receptive fuels.

Probability of Precipitation (POP): The likelihood of a precipitation event occurring at any given point in the forecast area. A precipitation event is the occurrence of a measurable amount (0.01 inch or greater) of liquid moisture falling during a specific period in the forecast area.

As guidance, an expression of uncertainty and areal qualifying terms would have the following relationship to POP values:

POP Statement Value	Expression of Uncertainty	Equivalent Areal Qualifier
<20%	slight chance	isolated, few
20%	slight chance	few, widely scattered
30-40%	chance	scattered
50%	good chance	scattered
60-70%	likely	numerous
80-100%	no remark	no remark

During dry periods, forecasts may contain mention of scattered or numerous showers and thunderstorms, but refer to only 10 or 20 percent chances for precipitation. This is indicative of virga or dry thunderstorms which have a greater chance of producing gusty winds and/or lightning than measurable rainfall.

Rate of Spread (ROS): The relative activity of a fire in extending its horizontal dimensions.

Red flag warning: A National Weather Service product that is issued when red flag conditions (i.e., a critical fire weather situation) are expected.

Relative humidity: The ratio of the amount of moisture in the air to the maximum amount of moisture that air would contain if it were saturated.

Remote Automatic Weather Station (RAWS): An apparatus that automatically acquires, processes and stores local weather data for subsequent transmission to the GOES satellite.

Routine fire weather forecast (FWF): A forecast, issued daily during the fire season, that is intended for planning purposes by land management agencies. Also called general fire weather forecast or simply fire weather forecast.

Running fire: Behavior of a fire spreading rapidly with a well defined head.

Sea breeze boundary: A surface boundary produced by the push of marine air into the land areas.

Short-range spotting: Firebrands, flaming sparks or embers carried by surface winds which start new fires beyond the zone of direct ignition by the main fire.

Six-foot wind: See eye-level wind.

Sky cover:
Clear...Zero to 1/10 opaque cloud cover.
Mostly Sunny...1/10 to 2/10 opaque cloud cover. The prevailing condition is sunny, but some clouds may be present either over a portion of the area or for a short time over the entire area.
Fair...Less than 4/10 opaque cloud cover. No precipitation. No extremes in weather, visibility, temperature, or wind.
Partly cloudy/partly sunny...3/10 to 6/10 opaque cloud cover.
Mostly cloudy/considerable cloudiness...7/10 to 8/10 opaque cloud cover. Cloudiness will be subject to some variability in amount or location.
Cloudy...9/10 or greater opaque cloud cover. The sky is essentially covered throughout the forecast period.

Slash: Debris resulting from such natural events as wind, fire or such human activities as logging, pruning or brush cutting.

Slope percent: The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent.

Snag: A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen.

Spot fire: Fire ignited outside the perimeter of the main fire by a firebrand.

Spot forecast: A specific weather forecast issued for a particular fire at a specific location.

Spotting: Behavior of a fire producing sparks or embers that are carried by the wind and which

start new fires beyond the zone of direct ignition by the main fire.

Squall line: A narrow band or line of thunderstorms producing gusty winds.

Suppression: All the work of extinguishing or confining a fire beginning with its discovery.

Surface fire: Fire that burns loose debris on the surface.

Surface fuel: Fuels lying on or near the surface of the ground.

Surface trough: A narrow area of low atmospheric pressure located at the surface.

Sustained attack: Continuing fire suppression action until fire is under control.

Ten-hour fuel moisture: The moisture content of dead fuels which have diameters between 1/4 and 1 inch.

Timelag: Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content.

Torching: The burning of the foliage of a single tree or a small group of trees from the bottom up.

Total fuel: All plant material both living and dead that can burn in a worst case situation.

Transport winds: The mean wind speed and direction of all winds between the surface and mixing height.

Transport winds at 500 meters: The forecast transport winds at the time in which the mixing height is expected to reach 500 meters.

Tropical wave: An area of disorganized convection in the tropics.

Twenty-foot wind: Wind observed at regular RAWS/FTS observation stations, typically forecast by meteorologists, and influenced somewhat by vegetation and terrain. These winds are evaluated at either 20 feet above the surface or 20 feet above a solid layer of vegetation.

Uniform fuels: Fuels distributed continuously, thereby providing a continuous path for fire to spread.

User agency: Any agency that relies on fire weather forecast products from the National Weather Service.

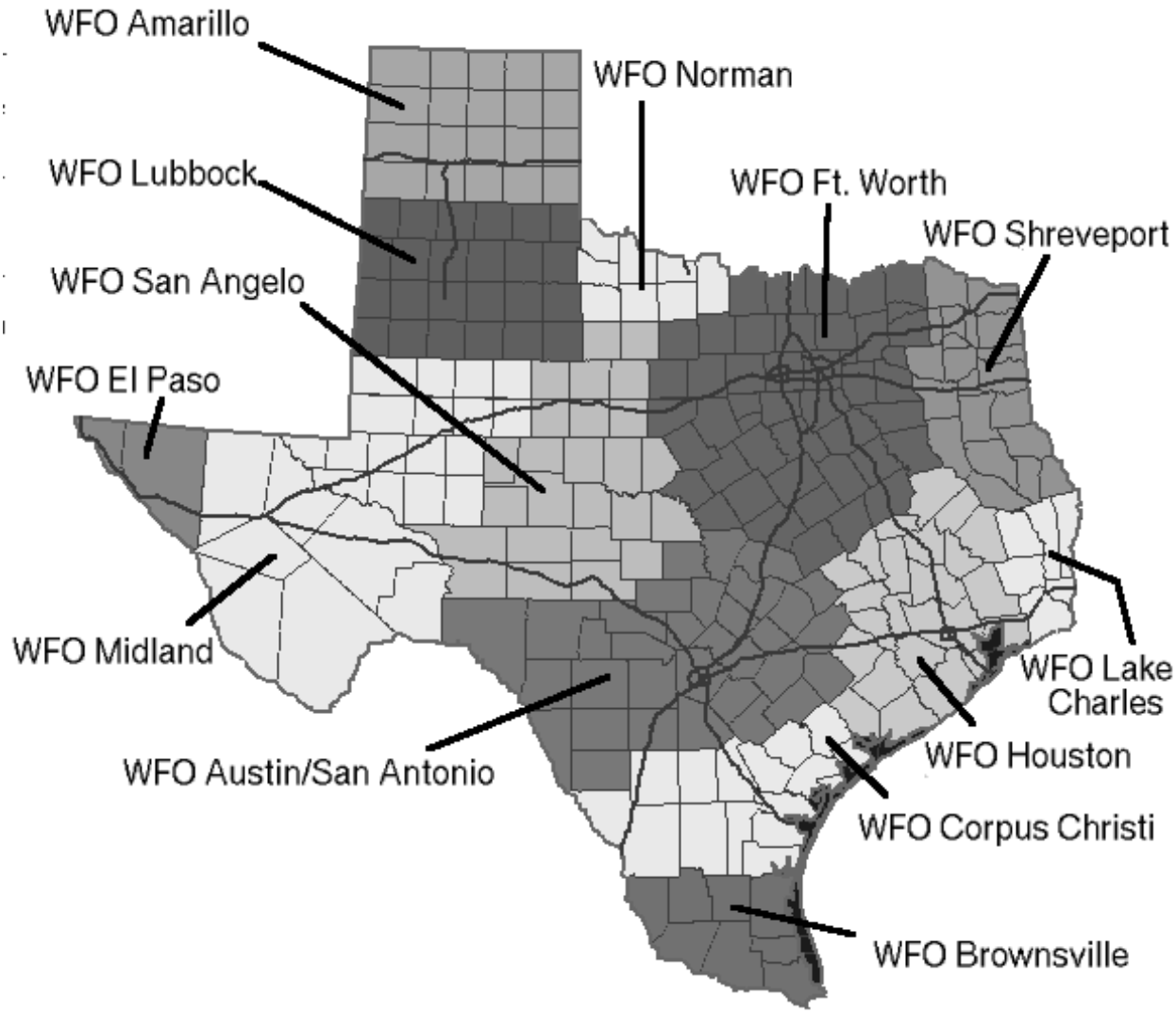
Weather Information and Management System (WIMS): An interactive computer system designed to accommodate the weather information needs of federal and state natural resource management agencies.

Wetting rain: A widespread rain that over an extended period of time significantly reduces fire danger. Usually greater than 0.10 inches.

Wildfire: An unplanned wildland fire requiring suppression action or other action according to agency policy.

Wildland: An area in which development is essentially non-existent.

Wind-driven wildland fire: A wildland fire that is controlled by a strong consistent wind.



Appendix 2: County Warning and Forecast Areas for NWS Offices

Appendix 3
RAWS/FTS Sites Across Texas (Under construction)

Appendix 4
Sample Narrative and Tabular Fire Weather Forecast Formats

The following examples provide guidelines to routine fire weather forecast formats. Excluding sections identified as required elements, forecast formats from various offices will vary slightly from these two general formats.

Example of a Morning Narrative Fire Weather Forecast:

FNUS55 KMSO DDHHMM
FWFMSO

FIRE WEATHER FORECAST FOR WESTERN MONTANA
NATIONAL WEATHER SERVICE MISSOULA MONTANA
9 AM MDT THU JUL 10 1999

...HEADLINE... (**REQUIRED** for Red Flag Warnings and Fire Weather Watches....brief significant feature(s) at other times recommended)

.DISCUSSION...(concise, clear, non-technical explanation of the current/forecasted fire weather)

UGC/FIPS CODING
GEOGRAPHICAL DESCRIPTORS (including counties or other land management governing units and/or optional fire weather zone numbers)

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE (<u>as needed</u> in each appropriate zone grouping) ...

.TODAY
SKY/WEATHER/POP.....
MAX TEMPERATURE...
24 HR TREND:
MIN HUMIDITY.....
24 HR TREND:
WIND - 20 FT/10-min avg
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

.TONIGHT
SKY/WEATHER.....
MIN TEMPERATURE...
MAX HUMIDITY.....
WIND - 20 FT/10-min avg

(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

.SATURDAY (following day)
SKY/WEATHER.....
MAX TEMPERATURE...
MIN HUMIDITY.....
WIND - 20 FT/10-min avg
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

=
$$

[forecast for next geographical descriptor and/or fire weather zone group]

=
$$

.EXTENDED FORECAST... (include weather elements per locally-established policy)
.SUNDAY...
.MONDAY...
.TUESDAY...
.WEDNESDAY...
.THURSDAY...

NAME (**OPTIONAL**)

NNNN
=
$$

Example of an Afternoon Narrative Fire Weather Forecast:

FNUS55 KMSO DDHHMM
FWFMSO

FIRE WEATHER FORECAST FOR WESTERN MONTANA
NATIONAL WEATHER SERVICE MISSOULA MONTANA
3 PM MDT THU JUL 10 1999

...HEADLINE... (**REQUIRED** for Red Flag Warnings and Fire Weather Watches....brief significant feature(s) at other times recommended)

.DISCUSSION...(concise, clear, non-technical explanation of the current/forecasted fire weather)

UGC/FIPS CODING
GEOGRAPHICAL DESCRIPTORS (including counties or other land management governing units and/or optional fire weather zone numbers)

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE (<u>as needed</u> in each appropriate zone grouping) ...

.TONIGHT
SKY/WEATHER/POP.....

MIN TEMPERATURE...
24 HR TREND:
MAX HUMIDITY.....
24 HR TREND:
WIND - 20 FT/10-min avg
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

.FRIDAY (next day)
SKY/WEATHER.....
MAX TEMPERATURE...
24 HR TREND:
MIN HUMIDITY.....
24 HR TREND:
WIND - 20 FT/10-min avg
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

.FRIDAY NIGHT
SKY/WEATHER.....
MIN TEMPERATURE...
MAX HUMIDITY.....
WIND - 20 FT/10-min avg
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)

.SATURDAY (following day)
SKY/WEATHER.....
MAX TEMPERATURE...
MIN HUMIDITY.....
WIND - 20 FT
(slope/valley...general wind...etc.)
(ridge top...etc)

LOCAL OPTIONAL ELEMENTS...(transport winds, mixing heights, LAL, Haines, etc)
=
$$

[forecast for next geographical descriptor and/or fire weather zone group]

=
$$

.EXTENDED FORECAST... (include weather elements per locally-established policy)
.SUNDAY...
.MONDAY...
.TUESDAY...
.WEDNESDAY...
.THURSDAY...

NAME (**optional**)
NNNN
=
$$

Example of a Tabular Fire Weather Forecast:

FNUS55 KTBW DDHHMM
FWFTBW

FIRE WEATHER FORECAST FOR WEST-CENTRAL FLORIDA
NATIONAL WEATHER SERVICE TAMPA BAY/RUSKIN FL
300 PM EST TUE JAN 1 2001

...HEADLINE... (**REQUIRED** for Red Flag Warnings and Fire Weather Watches....brief significant feature(s) at other times recommended)

.DISCUSSION...(concise, clear, non-technical explanation of the current/forecasted fire weather)

FLZ034>038-021500-
LEVY CITRUS HERNANDO SUMTER PASCO (GEOGRAPHIC DESCRIPTORS)
300 PM EST DAY TUE JAN 1 2001

	TONIGHT	**WED**	**WED NIGHT**	**THURSDAY**
	---	---	---	---
CLOUD COVER	**CLOUDY PCLDY**	**PCLDY**	**CLEAR**	
PRECIP CHANCE	**100%**	**30%**	**30%**	**0%**
PRECIP TYPE	**TSHWR**	**FRZ RAIN**	**SNOW/RAIN**	**NONE**
TEMP (24H TREND)	**70 (+4)**	**30 (-40)**	**25**	**45**
RH % (24H TREND)	**100 (+20)**	**55 (-10)**	**80**	**45**
20FT WND MPH(VALLEY)	**W 15**	**N 20**	**N 7**	**N 12**
20FT WND MPH(RIDGE)	**W 20G30 N 25**	**NW 12**	**N 30**	
PRECIP DURATION 6	3			
PRECIP BEGIN	6 PM	6 AM		
PRECIP END	6 AM	2 PM		
PRECIP AMOUNT	0.50	0.10		
LAL	5	1		
HAINES INDEX (LOW)	4	2		
HAINED INDEX (MID)	4	3		
MIXING HGT (AGL) 10000	3500			
TRANSPORT WIND(KTS)	W 17	N 17		
VENT RATE (KT-FT)	17,000	5,700		
DISPERSION	EXLNT	FAIR		
SUNSHINE HOURS B	-			
(OTHER LCL OPTIONS)	???	???		

REMARKS...STRONG COLD FRONTAL PASSAGE WILL SHIFT WINDS TO NORTHERLY LATE TONIGHT.

.FORECAST FOR FRI-SUN...

Appendix 5 Special Request Form D-1 *(under construction)

Appendix 6: NATIONAL AGREEMENT FOR METEOROLOGICAL SERVICES IN SUPPORT OF AGENCIES WITH LAND MANAGEMENT AND FIRE PROTECTION RESPONSIBILITIES

(This document taken from NOAA/NWS Operational Manual Chapter D-6)

I Introduction

This National Agreement is between the National Weather Service (NWS) and agencies with

land management and fire management responsibilities signatory to this agreement. They are referred to in this agreement as "NWS" and "USER AGENCIES," respectively.

The User Agencies are responsible for the maintenance, improvements, and protection of the wild lands, of owned or held in trust by the United States. Accurate and timely weather information is required to manage effectively and efficiently this valuable national resource. The NWS has the expertise, organization, and legal charter to satisfy this need nationally. It is with this knowledge that this Agreement is entered into. Its purpose is to combine resources so as to best serve the needs of the public and to fulfill the obligations of the respective agencies.

C. Authority

This agreement is authorized under the Economy Act (31 U.S.C. 686; 15 U.S.C. 313; 49 U.S.C. 1463) and the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2101), etc.

III Objectives

The objectives of this Agreement are to identify meteorological services to be provided, establish the interagency relationships, and define financial and other obligations of the NWS and User Agencies.

IV Responsibilities

1. National Weather Service

IV Basic Meteorological services will be provided during normal working hours in accordance with Operating Plans for designated NWS offices to the extent of NWS fire weather resources. NWS regional headquarters will identify to the User Agency headquarters a list of the designated fire weather offices on an annual basis. These services will be made available without cost and may include:

- IV Routine daily fire weather forecasts
- IV Outlooks and discussions
- IV Weather observations
- IV Red flag forecasts
- IV Spot forecasts
- IV Prescribed burn forecasts
- IV Smoke management forecasts and information
- IV Consultation and technical advice
- IV Amendments / updates

IV Fire Weather Training

The NWS recognizes the need for training in fire weather meteorology for

NWS forecasters. To the extent of available resources, the NWS will meet this need.

IV Special meteorological services
These services will be provided by designated NWS offices on a reimbursable basis as stated in Section IV B.
- IV Weather observer training
- IV Weather observation station visitations
- IV Participation in User Agency training activities
  - IV Course development carried out at User Agency facilities
  - IV Classroom training
- IV On-site meteorological services
- IV Other special services

B. User Agencies

The following services and resources will be provided by User Agencies:

A. Fire-management computer systems
Where existing fire management computer systems are locally available, access to the system will be provided.

B. Fire weather observations
- A. Provide daily surface weather observations and enter data into fire-management computer systems
- B. Provide all equipment, equipment maintenance, and inspection of weather-observing sites.
- C. Meet all travel and per diem costs associated with User Agencies' requests for visits of NWS personnel to weather-observing sites.
- D. Provide for collection of remote automatic weather systems data and entry into the fire-management computer system.
- E. Provide observations for site-specific and other special forecasts.

C. On-site meteorological support
- A. Meet costs directly associated with on-site meteorological support by NWS personnel. This includes costs incurred by the backup NWS office.
- B. Provide logistical and weather observation support to NWS personnel at on-site operations.
- C. Provide access to telecommunication services where available.

D. Training
- A. Meet per diem and travel costs for NWS personnel participating in the conduct of User Agency training.

B. Provide technical assistance, instruction, and supporting material for NWS-sponsored fire weather training sessions.

E. Other special services
User Agencies will provide logistics support and meet all overtime, travel, and per diem costs of NWS personnel associated with the provision of all other special services.

C. Joint Responsibilities
NWS and User Agencies shall prepare an annual Operating Plan for individual fire weather office areas of responsibility. This plan will identify the basic weather services covered under Section IV.

V Procedures for requesting services

Procedures for ordering services will be specified in Operating Plans for each NWS fire weather office.

VI Billing Procedures

Costs to be recovered from User Agencies will be calculated on the basis of expense reports submitted to the NWS regional headquarters by field personnel. Copies of expense reports will be forwarded to appropriate User Agencies by NWS regional headquarters. This procedure will enable agencies to accurately determine costs to be reimbursed during a given fiscal year. Billing of User Agencies will be accomplished by NWS regional submission of appropriate expense reports to the NOAA Reimbursables Division. Bills will include a statement of service rendered, dates it was provided, and location where provided.

All questions relating to billing procedures, charges, current costs, and individual expense reports should be directed to the appropriate NWS regional contact or the NWS Technical Monitor.

VII Amendments

Upon written notice, the terms of this Agreement are subject to amendment at any time by mutual agreement of the parties.

The signatory agencies agree to consider expansion of this Agreement to cover areas of mutual concern, e.g., changing technology and improved procedures, as opportunities for such cooperation become available.

VIII Terms of National Agreement

1. The terms of this Agreement shall become effective upon execution by NWS and

any or all User Agencies and shall remain in effect until such times as the Agreement is terminated by mutual agreement. Any agency may withdraw at any time by ninety (90) days written notice to all parties.

2. This Agreement does not constitute a financial obligation for any party in excess of appropriations authorized by law and administratively allocated for the purposes intended.

9. Technical Monitor For NWS

The NWS Technical Monitor for this Agreement shall be:

Fire Weather Program Manager, W/OM12
NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910

Telephone: (301) 713-1677 ext. 131

Definitions

When the following terms are used in this Agreement or in an operating plan, such terms will have the meanings stated below.

1. Fire Weather Office Operating Plan
A procedural guide which describes the services provided within the area of a fire weather office's responsibility.

2. Basic Meteorological Services
Basic meteorological services are those state-of-the-science meteorological forecasts, warnings, observations, and statements produced in a designated NWS fire weather office during normal working hours.

3. Fire Weather Zone or District
A fire weather zone or district is the are of routine service responsibility as defined by the NWS. This area is usually defined by climatological factors, but may be modified somewhat to the administrative boundaries of the User Agencies.

4. Normal Working Hours
Normal working hours are defined in the Operating Plan, but usually cover 8-hour workdays, Monday through Friday, except during fire season when the normal hours cover 7 days a week

E. Prescribed Fire
Prescribed fire is a fire burning in wildland fuels according to a planned prescription and confined within planned boundaries for the purpose of achieving specific objectives of

resource management. (Prescribed burning is the practice of prescribed fire use.)

F. Red Flag

Red flag is a program which highlights the onset of critical weather conditions conducive to extensive wildfire occurrences.

G. Special Meteorological Services

Meteorological services uniquely required by User Agencies which cannot be provided at a designated NWS fire weather office during normal working hours.

H. Spot Forecasts

Spot forecasts are site-specific weather forecasts. They are issued upon request of User Agencies for wildfire, prescribed burns, or special projects.

I. On-site

That special service which dedicates a fire weather forecaster to a wildfire, prescribed fire, or special project such that the fire weather forecaster is removed from providing basic services at his/her assigned weather office.

Appendix 7: Internet Links

National Weather Service Links:

Southern Region Fire Weather	http://www.srh.noaa.gov/ftproot/ssd/html/firewx.htm
National Fire Weather Products	http://www.boi.noaa.gov/firewx.htm
Storm Prediction Center	http://www.spc.noaa.gov/fire/
NWS Amarillo, TX	http://www.srh.noaa.gov/ama/html/firewx.htm
NWS Austin/San Antonio, TX	http://www.srh.noaa.gov/ewx/html/firewx.htm
NWS Brownsville, TX	http://www.srh.noaa.gov/bro/fire.htm

NWS Corpus Christi, TX	http://www.srh.noaa.gov/crp/fire/default.html
NWS El Paso, TX	http://www.srh.noaa.gov/elp/misc/firewx.html
NWS Fort Worth, TX	http://www.srh.noaa.gov/fwd/cgi-bin/get_text.pl?+FTWFWFFTW+1
NWS Houston/Galveston, TX	http://www.srh.noaa.gov/hgx/fire.htm
NWS Lake Charles, LA	http://www.srh.noaa.gov/lch/testfire.htm
NWS Lubbock, TX	http://www.srh.noaa.gov/data/lbb/fwf/lbbfwflub.recent.txt
NWS Midland/Odessa, TX	http://www.srh.noaa.gov/maf/html/fire_weather.html
NWS Norman, OK	http://www.srh.noaa.gov/oun/firewx/
NWS San Angelo, TX	http://www.srh.noaa.gov/sjt/html/firewx/firewx.html
NWS Shreveport, LA	http://www.srh.noaa.gov/shv/cgi-bin/firewx.pl

National and Regional Fire Weather Links:

Texas Interagency Coordination Center	http://ticc.fws.gov/
Texas Forest Service	http://txforestservice.tamu.edu/
National Interagency Fire Center	http://www.nifc.gov/
Southwest Area Coordination Center	http://www.fs.fed.us/r3/fire/
Southern Area Coordination Center	http://www.r8web.com/sacc/
USDA Forest Service Fire Site	http://www.fs.fed.us/fire/

National Park Service Fire Site http://fire.nifc.nps.gov/fire/default.htm

U.S. Fish & Wildlife Service Fire Site http://fire.r9.fws.gov/

USDA Wildland Fire Assessment System http://www.fs.fed.us/land/wfas

Miscellaneous Links:

Palmer Drought Index http://www.cpc.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Precipitation needed to bring the Palmer Drought Index to near normal ftp://ftp.ncep.noaa.gov/pub/cpc/sabol/palmer/req07dcd.gif

NOAA Experimental Fire Graphic http://www.ssd.noaa.gov/ssdfire.html

Climate Prediction Center Forecasts http://www.cpc.noaa.gov/products/predictions/

Appendix 8: NWS Contacts

NWS SOUTHERN REGION HEADQUARTERS (SRH) **819 Taylor Street, Room 10E09**
Fort Worth, TX 76102
IMET/ATMU Coordination **817-978-1100 Ext. 116**
Paul Witsaman **FWPM** **Paul.Witsaman@noaa.gov**
Pager **877-723-5184**
Bill Proenza **RD** **Bill.Proenza@noaa.gov**

NWS OFFICE AMARILLO (AMA) **1900 English Road**
Amarillo, TX 79108
Main Telephone System **806-335-1825**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Ken Schneider **FWPL** **Ken.Schneider@noaa.gov**
Jose Garcia **MIC** **Jose.Garcia@noaa.gov**

NWS OFFICE AUSTIN/SAN ANTONIO (EWX) **2090 Airport Road**
New Braunfels, TX 78130
Main Telephone System **830-629-0130**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Monte Oaks **FWPL** **Monte.Oaks@noaa.gov**
Joe Arellano **MIC** **Joe.Arellano@noaa.gov**

NWS OFFICE BROWNSVILLE (BRO) **20 South Vermillion**
Brownsville, TX 78521-5798
Main Telephone System **956-504-3184**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

	FWPL	
Richard Hagan	**MIC**	**Richard.Hagan@noaa.gov**

NWS OFFICE CORPUS CHRISTI (CRP) **300 Pinson Drive**
Corpus Christi, TX 78406-1803
Main Telephone System **361-299-1353**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

Michael Buchanan	**FWPL**	**Mike.Buchanan@noaa.gov**
Ken Graham	**MIC**	**Kenneth.Graham@noaa.gov**

NWS OFFICE EL PASO AREA (EPZ) **7950 Airport Road**
Santa Teresa, NM 88008
Main Telephone System **505-589-4088**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

Tom Bird	**FWPL**	**Tom.Bird@noaa.gov**
Max Blood	**MIC**	**Max.Blood@noaa.gov**

NWS OFFICE FORT WORTH (FTW) **3401 Northern Cross Blvd.**
Fort Worth, Texas 76137-3610
Main Telephone System **817-831-1157**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

Joe Harris	**FWPL**	**Joe.Harris@noaa.gov**
Bill Bunting	**MIC**	**William.Bunting@noaa.gov**

NWS OFFICE HOUSTON/GALVESTON (HGX) **1620 Gill Road**
Dickinson, TX 77539
Main Telephone System **281-534-2157**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

Richard Hitchens	**FWPL**	**Richard.Hitchens@noaa.gov**
Bill Read	**MIC**	**Bill.Read@noaa.gov**

NWS OFFICE LAKE CHARLES, LA (LCH) **500 Airport Blvd., #115**
Lake Charles, LA 70607-0668
Main Telephone System **337-477-5285**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)

Kent G. Kuyper	**FWPL**	**Kent.Kuyper@noaa.gov**
Steve Rinard	**MIC**	**Steve.Rinard@noaa.gov**

NWS OFFICE LUBBOCK (LBB) **2579 South Loop 289, Suite 100**
Lubbock, TX 79423-1400
Main Telephone System **806-745-3916**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Jose Valdez **FWPL** **Jose.Valdez@noaa.gov**
David "Rusty" Billingsley **MIC** **David.Billingsley@noaa.gov**

NWS MIDLAND/ODESSA (MAF) **2500 Challenger Drive**
Midland, TX 79703
Main Telephone System **915-563-5006**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Greg Murdoch **FWPL** **Gregory.Murdoch@noaa.gov**
Raymond Fagen **MIC** **Raymond.Fagen@noaa.gov**

NWS OKLAHOMA CITY/NORMAN, OK (OUN) **1200 Westheimer Drive, Room 101**
Norman, OK 73069
Main Telephone System **405-366-6583**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Thomas "Scott" Curl **FWPL** **Thomas.Curl@noaa.gov**
Mike Foster **MIC** **Mike.Foster@noaa.gov**

NWS SAN ANGELO (SJT) **7654 Knickerbocker Road**
San Angelo, TX 76904-7892
Main Telephone System **915-944-0526**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Phil Baker **FWPL** **Phillip.Baker@noaa.gov**
Shirley Matejka **MIC** **Shirley.Matejka@noaa.gov**

NWS SHREVEPORT, LA (SHV) **5655 Hollywood Ave.**
Shreveport, LA 71109-7750
Main Telephone System **318-635-9398**
(Coordination telephone and fax telephone contact information may be obtained by phone or e-mail request)
Bill Adams **FWPL** **William.Adams@noaa.gov**
Lee Harrison **MIC** **Lee.Harrison@noaa.gov**

RD - Regional Director **FWPM - Fire Weather Program Manager**
FWPL - Fire Weather Program Leader **MIC - Meteorologist in charge**